

MESORHABDITIS KINCHEGENSIS SP. NOV. (NEMATODA: RHABDITIDAE) FROM ARID SOIL IN KINCHEGA NATIONAL PARK

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Summary

NICHOLAS, W. L. (1998) *Mesorhabditis kinchegensis* sp. nov. (Nematoda: Rhabditidae) from arid soil in Kincheha National Park, *Trans. R. Soc. S. Aust.* 122 (2), 79-84, 29 May, 1998.

Mesorhabditis kinchegensis sp. nov. was collected in an anhydrobiotic state in dry red sand under a bluebush, *Maireana pyramidalis* (Benth.) Wilson, 1975. This is not the usual habitat for *Mesorhabditis* which is commonly associated with rich organic matter. The same species was also found in agricultural soil.

Distinguishing features of this species are that in the male the tips of the long, almost straight, distally fused spicules, are abruptly turned ventrally. The formula for the arrangement of the bursal papillae is (2+5+3) with none of the papillae fused at their bases. In the female the tail is long and pointed so that the distance from the posterior vulva to the anus is about one and a half times the tail length.

KEY WORDS: Anhydrobiosis, Australia, *Mesorhabditis*, nematode, soil, taxonomy.

Introduction

Most species of *Mesorhabditis* have been reported from rich decaying organic matter such as humus, rotting wood or dung. Several species are usually found in close association with insects. Few species have been found in arid habitats. The species described herein was collected in an anhydrobiotic state from dry sandy soil with little organic matter. One other species of *Mesorhabditis*, *M. spiculigera* (Steiner, 1936) Osche, 1952 has been reported to survive anhydrobiosis (Sudhaus 1978).

Osche (1952) subdivided the very large genus *Rhabditis* into seven subgenera, one of which was *Mesorhabditis*, with the type species *Rhabditis spiculigera* Steiner, 1936. The taxonomy of Rhabditidae has been extensively reviewed by Sudhaus (1974, 1976, 1978) who has retained *Mesorhabditis* at subgeneric rank. This view was not supported by Andrassy in his authoritative monograph on the suborder Rhabditina (Andrassy 1983) in which he considered *Mesorhabditis* to be a separate genus within the Mesorhabditinae, a rank accepted in this paper. Sudhaus (1991) was not, however, persuaded by Andrassy's arguments that *Mesorhabditis* has generic ranking. The difference in ranking rests on the taxonomist's inclination towards 'lumping' or 'splitting'.

Within the suborder Rhabditina, the combination of characters that distinguish *Mesorhabditis* are a monodelphic female with the vulva well posterior to the mid-point of the body and a pointed conical tail. The male has long, more or less straight spicules that are distally fused. The male bursa is peloderian with

paired bursal papillae arranged in three groups, typically two pre-cloacal, five peri-cloacal and three closer to the tip of the tail, expressed by the bursal formula (2+5+3).

Material and Methods

Several samples of dry sandy soil were taken with a cylindrical metal corer, 12.5 cm long, 5 cm internal diameter, close to and below a bluebush on 4 November 1984. The samples were placed in plastic bags and returned to the laboratory in Canberra. Ten days later subsamples of 5 g were placed on tissue paper in tap water in Baermann funnels. After 18 h the funnels were drained and the nematodes collected. From one subsample, taken from directly beneath the bluebush, fifteen specimens of a new species of *Mesorhabditis* were found (together with many other nematodes). This species was not found in any of the other samples.

The specimens of *Mesorhabditis* were fixed in 5% formalin and transferred to 5% aqueous glycerol, which was concentrated by evaporation at 40°C, then mounted on slides in anhydrous glycerol with cover slips supported by glass beads and ringed with Glyceol (Gurr). Drawings and measurements were made with a camera lucida attachment on a Zeiss Ultraphot microscope.

Type material has been deposited in the National Nematode Collection (ANIC) at the CSIRO Division of Entomology, Canberra ACT.

Mesorhabditis kinchegensis sp. nov.

(FIGS 1-8)

Holotype: ♂ Kincheha National Park, NSW, 4.xi.1984, ANIC Nematode Collection slide 0000005,

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specimen 000000007.

Paratypes: 6 ♂♂, 5 ♀♀, Kinchega National Park, 4.xi.1984, ANIC Nematode Collection slides 00000006-12, specimens 000000008-19.

Measurements: Table 1. Measurements in μm .

Description of Holotype male

Body cylindrical, slightly tapered at head, rather bluntly truncated at hind end (Fig. 1), tail short with peloderan bursa (Figs 1,3). Cuticle finely annulated, lateral field appears as three parallel lines beginning in cervical region and extending as far as tail (Fig. 3). Six offset, rounded, clearly separated lips, each bearing a prominent labial papilla (Fig. 5). Buccal cavity cylindrical, without pharyngeal collar, glottis possessing minute denticles, probably two (Fig. 5). Pharynx with strong muscular corpus, slightly expanded at metacarpus, narrow isthmus, surrounded by nerve ring, valved pharyngeal bulb terminating in very short trilobed cardia, surrounded by intestinal tissue (Fig. 2). Secretory-excretory pore, ventral, level with base of isthmus (Fig. 2). Intestine, initially filling pseudocoel, becoming compressed about halfway along body by gonad, followed by rectum opening at cloaca (Fig. 1). Tail short, sharply pointed. Single testis reflexed dorsally, leading to short vesicula seminalis and long vas deferens. Cloaca surrounded by a peloderan bursa with 10 pairs of papillae arranged (2+5+3) (Fig. 3).

Bursal papillae not fused at base, short posterior pair curled over. Two long narrow nearly straight spicules, capitulum distinct, distally fused, tips abruptly angled ventrally at about 25° to the main part, just beyond a slight constriction (notch) (Fig. 4). Gubernaculum a short straight rod. Posterior deirids at level of middle of spicules (Fig. 3).

Paratypes and other males

Measurements: Table 1.

All the male paratypes closely resemble the holotype. The level at which the spicules fuse, about 50% of their length, can only be clearly seen by squashing and rolling the specimen under a cover slip, which renders the specimen useless as a type specimen.

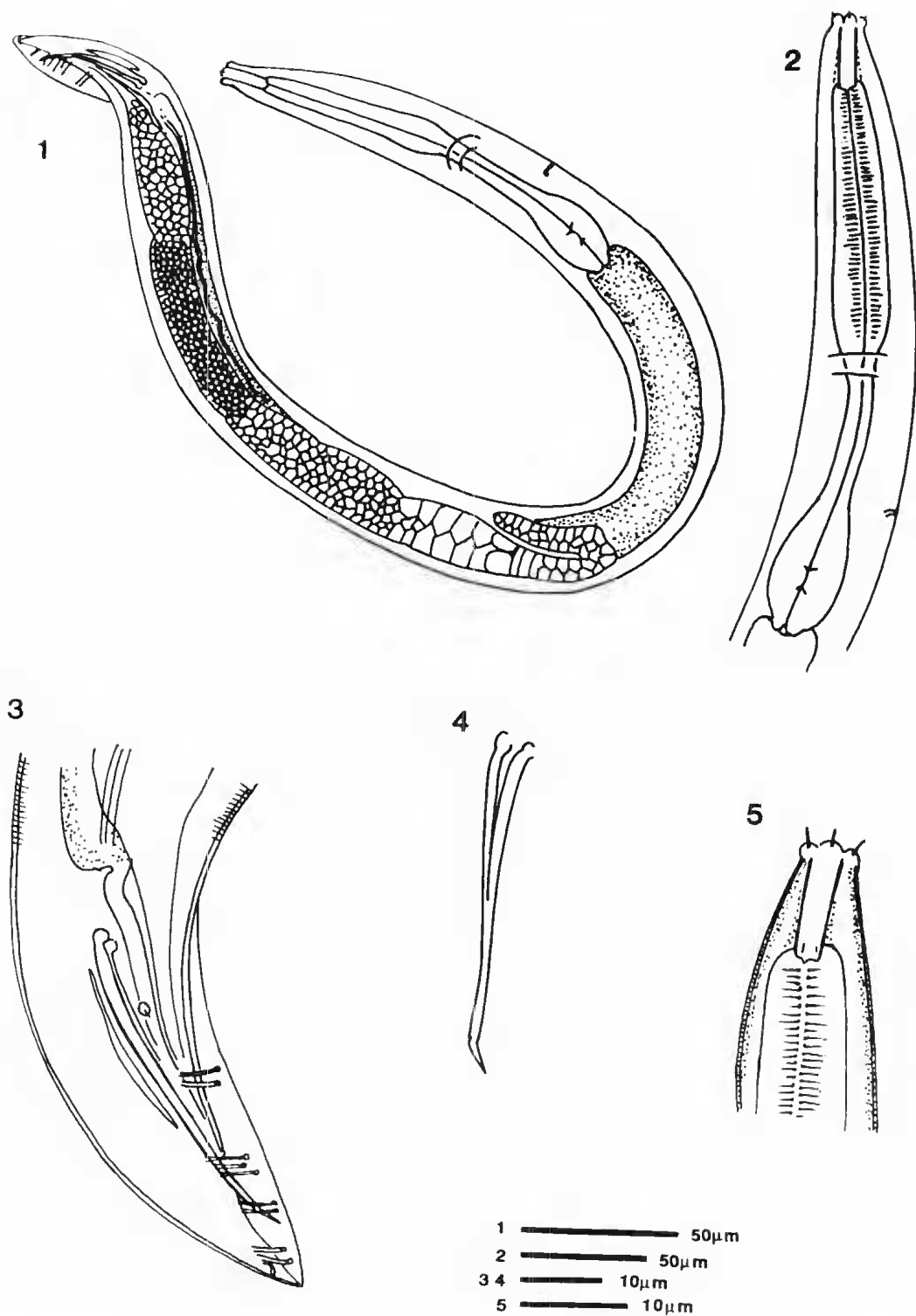
Female paratypes

Measurements: Table 1.

Female paratypes closely resemble males (Figs 6,7) except for reproductive organs and tail (Fig. 8). Homodromous ovary reflexed dorsally in mid region of body. Uterus extending to just beyond short vagina and vulva. One paratype female (Figs 6-8) possesses sperm in a short transitional region between ovary and uterus and six developing eggs, about $15\ \mu\text{m}$ in diameter and varying from 15 - 24 μm in length. Amphid fovea, a minute oval slit at base of lateral lips, visible only in this paratype.

TABLE 1. *Measurements of Mesorhabditis kinchegensis sp. nov.*

Sex/Type	Male/Holo		Male/Para n=6		Female/Para n=5		
		Mean	SD	Range	Mean	SD	Range
Length	524	482	39.30	432-533	543	71.96	467-662
Max. width	28	30	3.83	25-34	30	2.94	23-35
Buccal cavity	15	15	2.37	14-16	15	1.51	14-16
Corpus	61	54	4.27	51-57	58	1.51	56-60
Pharynx	129	126	1.27	119-130	122	6.91	118-128
Head to nerve ring	92	72	11.25	56-86	71	6.22	61-76
Head to secretory/excretory pore	116	92	10.42	77-106	81	20.10	55-103
Head to intestine	142	138	5.01	132-141	135	8.09	131-142
Head to gonad flexure	224	210	19.85	188-245	242	56.69	205-284
Head to vulva	-	-	-	-	439	61.96	378-455
Head to anus	490	459	36.91	410-507	493	57.21	355-518
Gonad length	288	278	13.97	268-295	301	134.14	186-535
Rectum length	39	31	4.08	23-31	32	6.10	20-35
Tail	22	23	3.31	18-27	50	14.77	32-76
Vulva to anus	-	-	-	-	65	7.89	57-76
Spicule	45	46	3.98	41-51	-	-	-
Gubernaculum	16	21	2.56	18-24	-	-	-
De Man's a	18.7	17	3.06	12.7-18.0	17.9	2.42	15.4-20.7
De Man's b	3.7	4	0.37	3.0-4.1	4.0	0.47	3.3-4.7
De Man's c	23.8	21	2.41	19.2-25.9	11.5	2.41	8.7-14.5
De Man's V%	-	-	-	-	81	2.32	77-82



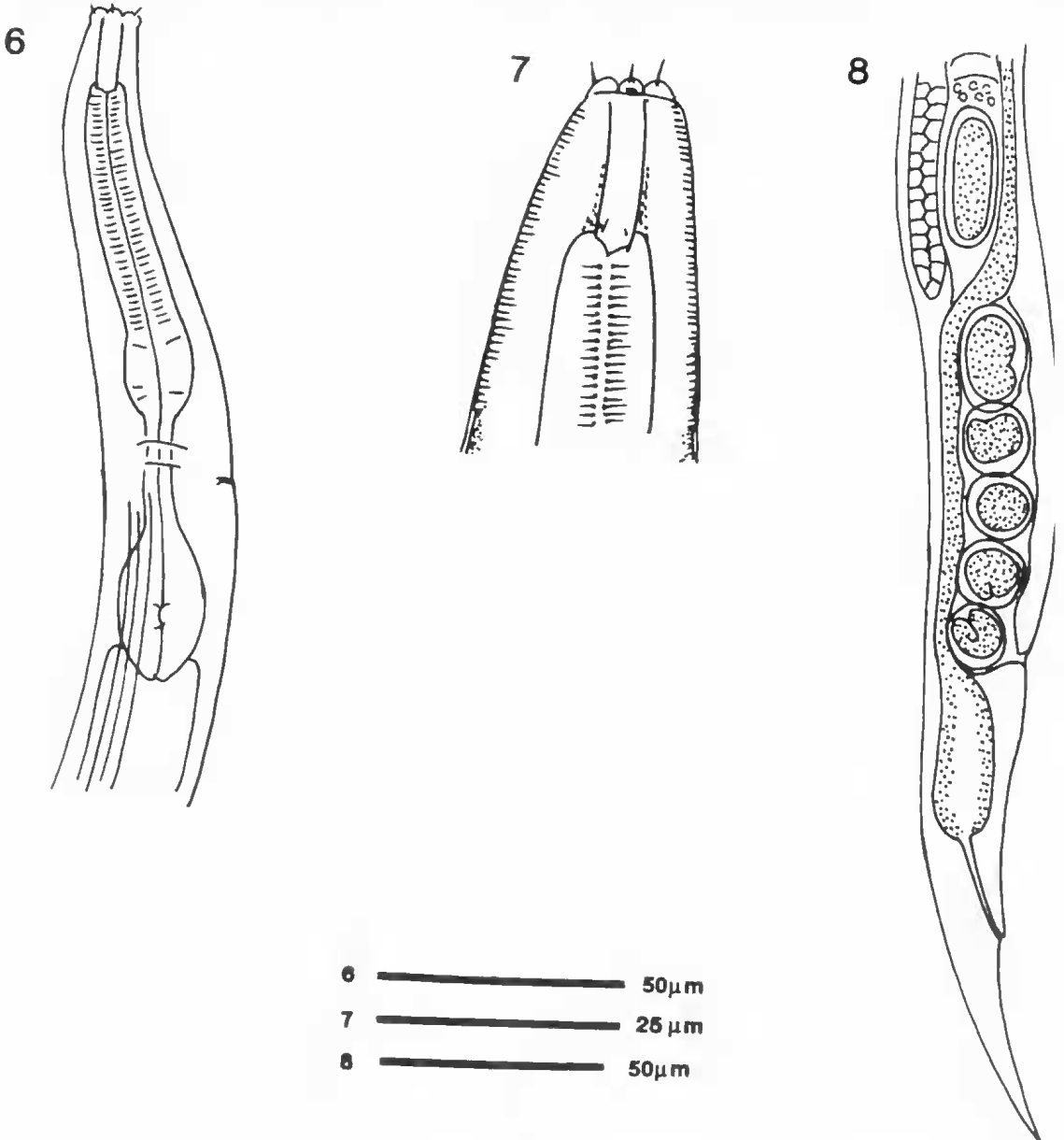
Figs 1-5. Holotype male. 1, Entire male. 2, Cervical region. 3, Cloacal region with spicules, gubernaculum, bursa and bursal papillae and lateral line in lateral view. 4, Spicules orientated to show fusion. 5, Head and buccal cavity.

female (Fig. 7). Tail conical and sharply pointed (Fig. 8). Vulva posterior and distance from vulva to anus about 1.5 x tail length. Lateral line marked by three incisures extending from mid pharyngeal region to caudal region (Fig. 6).

Differential diagnosis.

Mesorhabditis spiculigera (Steiner, 1936) Osche, 1952, is the only other species reported to survive periods in anhydrobiosis (Sudhaus 1978). It has a

world-wide distribution and has been reported from New Zealand but not from Australia. It differs from *M. kincheensis* sp. nov. in possessing a longer narrower buccal cavity, fusion of the bases of bursal rays 4, 5 and 6 and the tips of the spicules, though notched, are not angled ventrally. The ratio of length to width of the buccal cavity in *M. spiculigera* is about 10 : 1 (illustrated by Sudhaus 1974 Fig. 7), whereas in *M. kincheensis* it is about 4 : 5. Two other species, *M. szarvoghi* Andrassy, 1961 and *M.*



Figs 6-8. Paratype female, 6, Cervical region also showing the three incisures of the lateral line, 7, Head, 8, Posterior body showing reproductive organs.

longispiculosa (Schaarmans-Stekhoven, 1915) Dougherty, 1955, also have a notch close to the tip of the spicules, but unlike *M. kinchegensis*, their spicule tips are not angled ventrally beyond the notch.

Andrassy (1983) provides a useful key to the 17 species he recognises, a summary of diagnostic characters and references to taxonomic descriptions. Several species, *M. oschei* (Körner in Osche, 1952) Dougherty, 1955, *M. megachilis* (Sudhaus, 1978) Andrassy, 1983, *M. irregularis* (Körner in Osche, 1952) Dougherty, 1955, *M. szumyoghi*, *M. juglandicola* (Fuchs, 1937) Dougherty, 1955, *M. sudhausi* and *M. inarimensis* (Meyl, 1953) Dougherty, 1955 can be clearly distinguished by having a shorter female tail so that the distance from vulva to anus is much greater than the tail length. In the new species the distance is only about 1.5 x the tail length. A variety of features distinguishes other species from *M. kinchegensis*. In *M. miotki* (Sudhaus, 1978) Andrassy, 1983 the spicules are much shorter (29–36 µm) compared with 41–51 µm in *M. kinchegensis*. The buccal cavity of *M. unisomorphia* (Sudhaus, 1978) Andrassy, 1983 is asymmetric, the pharynx of *M. cranganorensis* (Khera, 1968) Andrassy, 1983 is unusually long, one third of body length. *Mesorhabditis africanus* Andrassy, 1982 has labial papillae curved inwards, *M. ultima* (Körner in Osche, 1952) Dougherty, 1955 has pointed lips. *M. tenuispiculum* (Körner in Osche, 1952) Dougherty, 1955, *M. belari* (Nigon, 1949) Dougherty, 1953 and *M. inarimensis* possess only nine buccal rays, the middle group having four instead of the more usual five. In *M. striatica* Daxsonville & Heyns, 1984, described by Daxsonville & Heyns (1984) after the publication of Andrassy's monograph, the lateral line has five incisures rather than the more typical three, as in *M. kinchegensis*. Sudhaus (1978) has observed aberrations in the tail length and buccal rays of individual specimens but the characters used to distinguish *M. kinchegensis* are consistent in all the type specimens described in this paper.

Habitat

Soil around plant roots. The type specimens were collected in dry sand in an anhydrobiotic state from around the roots of bluebush, *Maireana pyramidalis*,

in Kinchega National Park, NSW. Three males of the same species were collected by M. Hodda from a field of lupins on The Soil Conservation Experimental Farm at Cowra, NSW. These are in the ANIC collection. Nematode Collection slides 0001290, 0001295 and 0001286 but are not included as paratypes, as they come from a very different habitat and are mounted on slides with several other species of nematodes.

Distribution

At present the species is known from only two localities in New South Wales.

Discussion

The type specimens of *Mesorhabditis kinchegensis* sp. nov. come from an atypical habitat for *Mesorhabditis*, namely, arid soil with little organic matter in Kinchega National Park, although this species has also been collected from agricultural land. Kinchega National Park has a very irregular annual rainfall, averaging 235 mm, and an annual evaporation rate of 2000 mm. Temperatures reach 49°C in summer and fall to 0°C in winter. Most of the previously described species of *Mesorhabditis* have been found in decomposing organic matter such as mouldy or rotting wood, or humus (Andrassy 1983). Several others have been found in close association with insects such as scarabid beetle larvae. *Mesorhabditis megachilis* was associated with hymenopteran nests (Andrassy 1983). *Mesorhabditis sudhausi* has been reported from soil (Andrassy 1983) and *M. striatica* from fresh water (Daxsonville & Heyns 1984). *Mesorhabditis spiculigera*, the other species known to survive in anhydrobiosis, has been found in rotting wood and horse dung. Its dauer larvae were associated with dung beetles (Sudhaus 1978).

Acknowledgments

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